

16. *H. ellipticum* HOOK. Mostly herbaceous, 10 to 20 inches high: leaves elliptical-oblong, sessile or tapering at base, $\frac{1}{2}$ to $1\frac{1}{2}$ inches long, 3 to 5 lines wide, pellucid-punctate with large scattered dots, translucently veiny: flowers 4 to 6 lines in diameter, in few-flowered cymes, the dichotomal flowers pedicelled: sepals mostly foliaceous and spreading, oblanceolate to narrowly obovate, usually shorter than the pale yellow petals: capsule as in the last.—Fl. Bor.-Am. i. 110; Torr. & Gray, Fl. i. 164.

H. sphaerocarpum Barton, Fl. Philad. ii. 14, not Michx.

In moist ground, from Canada to Pennsylvania, westward to the Winnipeg valley.

Origin of the Flora of Indiana.

HARVEY THOMSON.

In an article of this nature it would not be advisable or necessary to enter into the details of the argument to prove that the original birthplace of our present flora is in the far north, near or even beyond the Arctic circle.

The origin of our present flora and the causes producing its present distribution present a rich field for thought and theory both to botanists and geologists, as the establishment of this theory of the northern origin of plants determines the temperature and climate of those regions in past geological periods. Many of the best thinkers of the botanical world have very ably discussed this subject in their writings. Noticeable among these are Dr. Asa Gray, Sir Joseph Hooker, Sir W. Dawson, De Candolle, Darwin, Wallace, Lesquereux, and others. Dr. Asa Gray first advanced his theory, before anything was known of the fossil life of the high northern latitudes, based upon the striking resemblances between eastern Asiatic and eastern American floras. The other writers have based their theories and conclusions upon the identity of many fossil plants, found in the cretaceous rocks of Greenland and the extreme northern part of the continent, with those of temperate latitudes of both America and Asia. These fossil plants were found by Dr. Lyall, Sir John Richardson and Sir Alexander Armstrong, and determined by Prof. Heer, of Zurich. There can, therefore, be no doubt as to the identity of these plants and, consequently, as to the origin of our temperate flora or the climate of those regions in the periods preceding the tertiary, as it is conceded that plants become acclimatized very slowly, if ever. During the glacial epoch these plants

must have been pushed much farther south than Indiana, as the glaciers themselves reached its southern border. The plants of Indiana have then stopped on their return journey from the south, during the epochs immediately succeeding the glacial, because they here found their original and natural climate and surroundings. Of course there may have been several minor counter-marches included in this general movement to the south and return, but these would not affect the general fact of the movement in the least. The physical geography of Indiana gives it an extremely variegated and abundant flora, from the high "knobs" of the Ohio valley on the south to the low swamps and tamarack groves of the lake regions of the north. This flora is also receiving continual additions from the railways and streams which traverse it or extend along its borders.

In the table below I have attempted to give, in the first column, the direction from this state in which the plants seem to be most abundant and most widely distributed; in the second the proportion of these which have the limit of their range in Indiana or some immediately adjoining state; in the third the proportion which go beyond this limit; in the fourth the proportion of the plants of each direction relatively to all those of the state; and in the last the number from each direction.

Direction.	Limited by Ind.	Extending beyond Ind.	Proportion of No. in State.	No. in State.
SOUTHEAST	72 per ct.	28 per cent.	about 23.p.ct.	274
All along the eastern coast from Canada to Florida and westward	52 " "	48 " "	" 17.9 "	213
NORTH	54 " "	46 " "	" 15.5 "	184
EAST	53 " "	47 " "	" 12.9 "	154
NORTHEAST	41 " "	59 " "	" 12.3 "	147
Common to all N. A. or at least to all U. S. and far northward.			" 8.2 "	98
Local, or limited by immediately adjacent states.			" 3.2 "	38
SOUTH	77 " "	23 " "	" 2.2 "	26
Along the Mississippi river			" 1.7 "	20
NORTHWEST	21 " "	79 " "	" 1.6 "	19
SOUTHWEST	89 " "	11 " "	" 1.5 "	18
Total number of plants in the state				1191

To this total number should be added a few more which have been found in the state since this list was made, in order to get the full number in the state at present. In this list all plants of European origin, or which have escaped from cultivation, have been omitted.

The fact that a little more than four-fifths of our plants have

a range extending north and east of our state, and that those south and southeast are found mostly on mountains, proves that the temperature of the arctic regions, where our flora originated, was some cooler during the cretaceous period than that of Indiana at present. As the same laws which now produce the warm equatorial current from the southwest prevailed during the tertiary period, no doubt the same difference in temperature between the eastern and western coasts of America existed then and extended much farther inland, owing to the absence of such high mountain ranges to break the force of the warm current. During the Champlain epoch, therefore, when these plants were seeking to escape the heat, they moved in an easterly as well as northerly direction.

It will be noticed that a much larger proportion of those plants belonging to the south southwest and southeast is limited by Indiana than of those from the north. This is caused by the natural barrier to northern progress presented by the Great Lakes and also by the fact that any plants remaining in or reaching the Mississippi valley will be very liable to be borne south by its river currents, so that a plant which is most abundant in the north may be found scattered along the banks of the Mississippi as far south as climate will permit its growth.

The Polypetalæ, Gamopetalæ and Monocotyledons have near the same proportions in the different directions and about that given in the table for all; while the Apetalæ, of which there are only one hundred and thirteen in Indiana, have 32% of their number southeast and the next largest number east—which in the table means along the eastern coast, but not so far north as Canada or south as Florida.

Among the Polypetalæ the Leguminosæ have the largest number in the southeast and next along the eastern coast from Canada to Florida, while the Rosaceæ are most abundant north and along the eastern coast respectively.

The Compositæ among Gamopetalæ have the largest number southeast, while those along the eastern coast are about as numerous.

Among Monocotyledons, however, the Cyperaceæ and the Gramineæ especially have a very large proportion common to all North America, or at least to the United States and far north into British America. Perhaps the mode of growth and reproduction of these families will partially account for their wide distribution.